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PATENT SPECIFICATION



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PROVISIONAL SPECIFICATION

Improvements relating to Towing and Release Mechanism

We, R. MALCOLM LIMITED, a British Company, and MARCEL JULES ODILON LOEILLE, a British subject and both of the Company's address, 601/602, Bath Road, Trading Estate, Slough, Buckinghamshire, do hereby declare the nature of this invention to be as follows:—

This invention relates to towing and release mechanism adapted for use in connection with the towing of aeroplanes but also applicable to many other uses where towing has to be effected and the towing connection has to be released or disconnected at will. As applied to the towing of gliders and the like by aeroplanes the invention is particularly useful for cases in which two aeroplanes acting as tugs are necessary to initiate the flight of a glider, but one of the tugs can be disconnected, leaving the other to carry on when the glider is airborne and is at a sufficient height above the ground. It will be convenient to describe the invention as applied to this purpose although it is not limited thereto.

When two aeroplanes serving as tugs are connected by cables to a single glider, the connection is generally made by the well known method of carrying the cables on the tugs around a pulley on a junction plate from which connections are taken to the glider. If the cable connection to one of the tugs were to be released in this case, allowing one end of the cable to run back to the junction plate while the other end was pulled out by the principal tug, there would be too long a period during which no pull would be applied through the cable to the junction plate, while the connections would sag, and the control would be lost. On the other hand there is no objection to a momentary release of the tension in disconnecting the assistant tug if the pull is almost immediately taken up by the principal tug. It is the object of the invention to enable this result to be attained in a satisfactory manner.

According to this invention the length of cable from the assistant tug to the junction plate is interrupted in the neighbourhood of the junction plate by the insertion of a release mechanism which will operate automatically if the assistant tug is

throttled down so that the pull in its cable is reduced, allowing the principal tug to go ahead. This will bring the release mechanism in the cable leading from the assistant tug up against a suitable member connected to the junction plate which serves automatically to effect the release of this point, leaving the principal tug to carry on with the towing operation through its own cable connected to the junction plate. The assistant tug is left with its own length of cable hanging free which it can release and drop by operating the release mechanism on the aeroplane, the length of cable being generally allowed to fall while the towing aeroplane is over the aerodrome so that it comes to ground and is recovered for future use.

The release mechanism operated by contact with a part attached to the junction plate may take various forms provided that it is sufficiently strong and reliable to effect the towing even while the cables are dragging along the ground at the aerodrome, while it can be released even under tension when in flight. This is essential because the assistant tug does not cease to pull suddenly but only reduces its pull so as to allow the principal tug to take over the towing duty.

In one form of the release mechanism the construction is as follows:—

A cable extending from the assistant tug is secured to an eyelet on a socket member containing spring-pressed pawls which are adapted to engage with the head of a plug connected to the length of cable which passes over or through the junction plate. On this junction plate there is provided a pivoted member through which the cable passes freely, and the head of this pivoted member is enlarged, for example to a ball shape, so that when the release device comes against the enlarged head of this pivoted member while the cable is running back through the junction plate, the head may serve to push the spring-pressed pawls out of action, so releasing the head of the plug on the end of the cable which passes through the junction plate. The socket member is thus released from the plug, allowing the socket member with the length of cable

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attached to the assistant tug to fall away freely. It is desirable that an inter-communication conducting wire should be carried through the cable from one tug to the other and should maintain inter-communication between them until the assistant tug becomes disconnected. For this purpose the cable may be made with a central conductor passing through it from the principal tug to the release mechanism, and from the socket member through the cable to the assistant tug. The socket member then has a spring clip or jack connected to the conductor on a cable leading to the assistant tug while the conductor in the principal cable is brought out through the plug on the end of this and through an insulating fitting to a rounded head or button which when the release mechanism is in engagement projects through the spring clip or jack. When the cable is released by the opening of the spring pawls of course the electric inter-communication is broken at this point.

The socket member is conveniently made with a cylindrical portion and a tapering portion leading to a narrower portion carrying the eyelet; the socket member being made in two parts which screw together. The inner member is slotted to receive the spring pawls which are mounted on pivot pins passing through the sides of the inner member beyond the slots, and the outer member when screwed up passes over the ends of the pivot pins, so keeping them in their proper location. The spring pawls are balanced statically about their pivots so that when the fitting is being knocked and jolted on the ground during the take-off there will be no fear that the jolts will cause either of the pawls to release its hold on the plug member. The pawls are conveniently pressed inwardly by springs which are arc-shaped and supported in recesses in the socket while their ends engage in bored-out depressions in the back of the pawls. Any other reliable spring arrangement may be used however which will not be liable to be broken or damaged by the shocks received during the take-off or on landing on the ground when released. The pawls may have rounded surfaces in the neighbourhood of the pivots to ensure that the ball-shaped head of the pivoted member on the junction plate can pass up freely between the pawls, and beyond their pivots so as to act with certainty against the inwardly extending arms of the pawls which have to be released from the head of the plug member on the cable end.

The surface of the plug member with which the pawls engage, and the cor-

responding surfaces of the pawls must of course be struck to a radius around the pivots of the pawls such that the pawls can be disengaged by the pressure of the ball-shaped member while the release mechanism is under substantial load.

In such a construction the length of the cable from the release mechanism back to the pulley or the like on the junction plate need not be very great provided it is sufficient to allow for a certain amount of pulling through of the cable or see-saw movement when one tug tends to pull ahead of the other slightly. It is only when the assistant tug is deliberately throttled down so that it lags substantially behind the principal tug that the release mechanism should be brought into action. The connection from each of the tugs may of course include such a release mechanism so that either of the tugs can become the principal tug while the other is disconnected. This reduces the risk of trouble due to either of the tug's engines failing for example shortly after the take-off.

As an alternative to the spring pressed pawl mechanism it is possible to make the connection by embodying the socket in the mechanical portion of the release mechanism. In one such construction the socket portion of the release mechanism consists of two jaws or half members pivotally connected for example at the eyelet which receives the end of the cable leading to the assistant tug. Each of these half members or jaws has a shelf or ledge in it for engaging under the head of the plug on the cable passing to the junction plate. The insides of the jaws are then formed with hook-shaped projections adapted to engage an annular channel under a rounded head on a fitting through which the cable passes freely. This fitting has a spring box mounted on it in the form of two telescoping members with a spring between them, one member being screwed or otherwise connected to the guide portion extending from the rounded head, while the other portion is pressed upwards toward the rounded head by the spring. When free, this portion of the spring box is pressed by the spring into the annular groove of the rounded head and extends outwardly therefrom so as to mask the groove and prevent any member from engaging with it until this part of the spring box is pressed backwardly again against the action of its spring. The cable again passes through a pivoted member on the junction plate which may have a rounded or ball-shaped head serving to operate the release as before described, the head portion of this pivoted member in the present case, however,

serving to push up the fitting having the rounded end above described so as to release it from the projections on the jaws of the socket member. When engaged 5 with these jaws, their projections entering the annular groove behind the rounded head bear against the sliding telescoping portion of the spring box, holding the spring compressed so that the 10 projections are gripped between this part of the spring box and the rounded head. If the spring were to fail in action, however, the gripping would still be effective 15 so long as the release mechanism was under tension. When the assistant tug is throttled down to allow its cable to run back toward the junction plate, the hinged member with the rounded head bears against the base of this fitting and of the 20 fixed part of the spring box screwed thereon, pressing the fitting up toward the plug on the end of the cable so that the jaws are released. The sliding portion of the spring box then snaps into position, 25 occupying the groove behind the rounded head so as to make sure that the jaws cannot accidentally become re-engaged with this head. Continued motion of the rounded head through the socket causes it 30 to bear against inclined surfaces within the jaws of the socket member, spreading these apart until their shelves or ledges come free from the plug connected to the cable. The plug then immediately falls 35 back against the rounded head which in turn is supported by the pivoted member on the junction plate, and the pull is transmitted to the junction plate from the principal tug which still remains connected thereto.

The above described examples of constructions according to the invention will suffice to illustrate its practical applications, and either form may be used if 45 found preferable according to the circumstances of any particular case. In the

first described form the socket member presents simple surfaces of revolution externally which are but little liable to damage on pulling over the ground or 50 falling. In the second described construction the jaws of the socket member can separate when released, and although they will generally remain close together, they are perhaps rather more likely to be 55 damaged by impact with the ground when falling.

In the second construction above described the end portions of the jaws containing the projections which engage in 60 the groove of the fitting with a rounded head may be made separately, each as the half of a conical member so that the two parts, when the jaws are closed, fit closely together. These parts may have flanges or 65 sockets to receive the ends of the jaws, and they are welded to these ends so as to form a unitary structure therewith. It is convenient to make these ends separately 70 so as to give ready access thereto for shaping the engaging surfaces before the ends are welded on to the jaws.

The construction may be modified in several respects in either case without departing from the scope of the invention, 75 but in all cases it will include a member through which the cable passes and against which a part of the release mechanism abuts to effect the release when it is required to disconnect the assistant tug 80 from the junction plate or other attachment connecting the member to be towed so as to effect its release. Precisely similar conditions may arise when two marine tugs are pulling a single vessel 85 and it may be required to release the connection to one of the tugs at short notice.

Dated this 6th day of April, 1943.

For the Applicants:

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COMPLETE SPECIFICATION

Improvements relating to Towing and Release Mechanism

We, R. MALCOLM LIMITED, a British Company, and MARCEL JULES ODILON LOBELLE, a British subject and both of the Company's address, 601/602, Bath Road, Trading Estate, Slough, Buckinghamshire, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to towing and release mechanism adapted for use in connection with the towing of aeroplanes but also applicable to many other uses where

towing has to be effected and the towing connection has to be released or disconnected at will. As applied to the towing of gliders and the like by aeroplanes the 105 invention is particularly useful for cases in which two aeroplanes acting as tugs are necessary to initiate the flight of a glider, but one of the tugs can be disconnected, leaving the other to carry on 110 when the glider is air-borne and is at a sufficient height above the ground. It will be convenient to describe the invention as applied to this purpose although it is not limited thereto.

When two aeroplanes serving as tugs are connected by cables to a single glider, the connection is generally made by the well known method of carrying the cables 5 on the tugs around a pulley on a junction plate from which connections are taken to the glider. If the cable connection to one of the tugs were to be released in this case, allowing one end of the cable to run 10 back to the junction plate while the other end was pulled out by the principal tug, there would be too long a period during which no pull would be applied through the cable to the junction plate, while the 15 connections would sag, and the control would be lost. On the other hand there is no objection to a momentary release of the tension in disconnecting the assistant tug if the pull is almost immediately 20 taken up by the principal tug. It is the object of the invention to enable this result to be attained in a satisfactory manner.

According to this invention the length 25 of cable from the assistant tug to the junction plate is interrupted in the neighbourhood of the junction plate by the insertion of a release mechanism which will operate automatically if the assistant tug 30 is throttled down so that the pull in its cable is reduced, allowing the principal tug to go ahead. This will bring the release mechanism in the cable leading from the assistant tug up against a suitable 35 member connected to the junction plate which serves automatically to effect the release at this point, leaving the principal tug to carry on with the towing operation through its own cable connected to the 40 junction plate. The assistant tug is left with its own length of cable hanging free which it can release and drop by operating the release mechanism on the aeroplane, the length of cable being generally 45 allowed to fall while the towing aeroplane is over the aerodrome so that it comes to ground and is recovered for future use.

The release mechanism operated by contact with a part attached to the junction 50 plate may take various forms provided that it is sufficiently strong and reliable to effect the towing even while the cables are dragging along the ground at the aerodrome, and that the connection can be 55 released when required while under tension when in flight. The coupling must in fact be of such a shape and so constructed that it will withstand rough treatment without disconnection while it 60 is bumping over the ground until the tugs and glider are air-borne, and yet can be released with certainty when the assistant tug takes action to effect disengagement. The release will occur while the coupling 65 is under considerable tension because the

assistant tug does not cease to pull suddenly but only reduces its pull somewhat so as to allow the principal tug to take over the towing duty.

In the accompanying drawings which 70 illustrate some forms of construction according to the invention:—

Figure 1 is a diagram of the twin tug towing system in use;

Figure 2 is a similar view showing the 75 conditions just after the assistant tug has caused its cable connection to be released;

Figure 3 shows the cables and junction plate to a larger scale;

Figure 4 is a view in elevation of one 80 form of the coupling on the end of the cable connected to the assistant tug;

Figure 5 is a sectional view corresponding to Figure 4;

Figure 6 shows the parts of Figure 5 85 at the moment of release;

Figure 7 is a sectional view of the spigot member for this coupling:

Figure 8 is a face view of a suitable form of junction plate, with its upper 90 plate removed;

Figure 9 is an end view of the junction plate;

Figure 10 is a sectional elevation of another form of the coupling: 95

Figure 11 is a partial sectional view showing how the coupling of Figure 10 effects release; and

Figure 12 is a plan view thereof.

Referring first to Figures 1 and 2, *a* is 100 the principal tug, *b* the assistant tug, and *c* the glider being towed. The junction plate *d* is connected to the glider by a bridle *l* which is generally of hemp rope. The cable *e*, generally of steel, is connected to the tug *a*, and cable *f* is connected to the tug *b*. Between these two cables is a length of cable *g* which passes through the junction plate and has a stop or buffer *t* at one end where it is connected 110 to cable *e*, while its other end carries a spigot member *u* hereinafter described (Figure 7) for engaging with a coupling *k* (Figures 4 and 5) at the rear end of cable *f*. At the junction plate the cable *g* 115 passes round a pulley *v* (Figures 8 and 9) and through a hollow plug member *h* which serves to release the coupling *k* when this is engaged by the plug member *h* as hereinafter described (Figure 6). So 120 long as the assistant tug is in action at the start of a flight, the buffer or stop *t* is generally kept up against the junction plate *d* as in Figure 1, because the assistant tug *b* is then pulling rather more 125 strongly than the principal tug *a*, so as to make sure that the coupling *k* is kept away from the plug member *h* on the junction plate. The length of cable *g* however allows of some to-and-fro motion of the 130

- cables relative to the junction plate without operating the release device in case the principal tug tends to go ahead momentarily.
- 5 When the tugs *a* and *b* and the glider *c* are in flight and at a sufficient altitude for safety, the pilot of the assistant tug *b* throttles down his engines somewhat until the coupling *k* comes against the plug *h*
- 10 while the principal tug *a* advances to the corresponding extent relatively to the glider *c*, and the coupling *k* is released. Figure 2 shows the condition of affairs just after this release has been effected, with the length of cable *f* still attached to the assistant tug *b*. The assistant tug then diverges from the previous direction of flight and operates a release at *m* so as to discard the length of cable *f*, generally
- 20 allowing it to fall within the area of the airfield from which the flight started. The length of cable *g* is still connected to the junction plate by the spigot member *u* engaging the plug member *h* so that the
- 25 glider can be towed by the principal tug *a*, which continues in flight to tow the glider *c* to its destination. Couplings at *n* on the principal tug *a* and at *o* on the glider *c* are then released to discard the
- 30 cables *f* and *g* and the junction plate *d*, with the bridle *l* connecting it to the glider.

Figure 3 shows the towing connections to a larger scale, indicating a suitable shackle connection at *p* for uniting the bridle *l* to the junction plate *d*, and plug terminals *q* on the ends of the bridle for engaging with the releasable couplings at *o* on the glider. Similar plug terminals are shown at *r* on the leading end of cable *f*, and at *s* on the leading end of cable *e* for engagement with the couplings at *m* and *n* respectively on the assistant tug *b* and the principal tug *a*. It is the coupling device at *k* and its method of release by contact with the plug member *h* which forms the principal feature of this invention.

Referring now to Figures 4 and 5 which show one form of this coupling, the loop on the end of cable *f* is engaged with the cross pin 12 which extends between the side cheeks 13 of the part 20 of the socket member *k*. One of these side cheeks also carries an electric terminal 14 for one of the leads of the intercommunication telephone, which leads are carried through the cores of all the cables and suitably inter-connected. A second terminal 15 is mounted in insulating bushes 16 fixed within the socket member. This terminal 15 carries a spring plunger 17 which, when the spigot *u* is engaged in socket *k*, makes contact with a member 18 in the head of the spigot *u*.

The body of the socket portion 20 is slotted to accommodate a pair of spring pawls 21 mounted on pivot pins 22 which pass through holes in the part 20 and are held in place by the screwing of the end 70 portion 19 over part 20 where it forms a shroud around the pawls. Springs 23 draw the upper ends of the pawls 21 inwardly causing them to engage behind the shoulder at 24 on the spigot *u*. The 75 pawls 21 have tail pieces 25 designed to balance them statically about their pivots 22 so that, when the coupling is being bumped and jolted over the ground during the take off, there should be no risk 80 that the jolts would cause either of the pawls to release its hold on the spigot *u*.

When the socket *k* comes into engagement with the plug member *h* as shown in Figure 6, the head end of the plug 85 member presses back the pawls 21 disengaging them from the shoulder 24 on the spigot *u* and so allowing the socket to separate from the spigot *u*. This spigot then remains bearing against the end of 90 plug member *h* to transmit the pull from the cables *e* and *g* to the junction plate *d* and so through the bridle *l* to the glider *c*. The engaging surfaces of the pawls 21 and the shoulder at 24 are so shaped that the 95 pawls can be pressed apart over the face of the shoulder when under load.

Electric contact is made with one electric lead in the cable *g* by a spring thimble 18 suitably insulated as at 26 in the end 100 of the spigot *u*, Figure 7, and arranged to bear against the spring plunger 17, while the other lead is connected to the outside of the spigot so as to make electrical connection with the socket *k* and so with the 105 terminal 14. Figure 8 shows some of the electric leads drawn out from the ends of cables *e* and *f* and from the bridle *l*. The lead 27 and 28 at the ends of cables *e* and *f* nearest the plugs *s* and *r* may be connected 110 to suitable terminals (not shown) in the tugs *a* and *b*, while the leads 29 on one limb of the bridle *l* are for connection to terminals (not shown) on the glider *c*, and leads 30 at the other end of the bridle are 115 connected to terminals on the junction plate *d* from which electrical connections are made to cable *g* in a suitable manner forming no part of the present invention. The connections between the leads in 120 cables *g* and *e* are made internally in the buffer *t* in a manner which also forms no part of this invention, but they can be connected in any other convenient manner.

Referring now to Figures 8 and 9, it is seen that the pulley *v* is pivoted on an axis *y* between two side plates of the junction plate *d*, and the cable *g* enters through a passage in a block *w*, embraces the pulley 125 130

v, and emerges again through the hollow plug member h which is pivoted at a between the side plates. It is the block u against which the buffer t bears while the 5 assistant tug is in action, and the plug member h against which the spigot u bears when the principal tug a is towing alone.

In the alternative form of coupling 10 shown in Figures 10 to 12, the socket portion of the release mechanism consists of two jaws or half members 31 and 32 pivotally connected at the eyelet 53 which receives the looped end of the cable leading 15 to the assistant tug b. Each of these half members or jaws 31 and 32 has a shelf or ledge in it at 33 for engaging under the disc or head 34 on the end of the cable g passing to the junction plate d. The insides of the jaws 31 and 32 are then 20 formed with hook-shaped projections 36 adapted to engage an annular channel under a rounded head 37 on a tubular fitting 38 through which the cable g passes 25 freely. This fitting 38 has a spring box mounted on it in the form of two telescoping members 39 and 40 with a spring 41 between them, one member 39 being screwed or otherwise connected to the 30 tubular guide portion 38 extending from the rounded head 37, while the other portion 40 is pressed upwards toward the rounded head by the spring 41. When free, this portion 40 of the spring box is 35 pressed by the spring into the annular groove of the rounded head 37 and extends outwardly therefrom so as to mask the groove and prevent any member from engaging with it until the part 40 of the 40 spring box is pressed backwardly by hand against the action of its spring 41. The cable g again passes through a pivoted plug member h on the junction plate d which plug member has a rounded or ball-shaped head 42 serving to operate the 45 release. This head portion in the present case serves to push up the fitting 38 having the rounded end 37 so as to release it from the projections 36 on the jaws 31, 32 50 of the socket member. When the head 37 is engaged with these jaws, their projections 36 entering the annular groove behind the rounded head 37 bear against the sliding telescoping portion 40 of the 55 spring box, holding the spring 41 compressed so that the projections 36 are gripped between this part 40 of the spring box and the rounded head 37. If the 60 spring were to fail in action, however, the engagement would still be effective so long as the coupling mechanism was under tension. When the assistant tug b is throttled down to allow its cable to run back toward the junction plate, the 65 hinged member h with the rounded head

42 bears against the base of the fitting 38 and of the fixed part 39 of the spring box screwed thereon, pressing the fitting up toward the disc 34 on the end of the cable g. The rounded head 37 slides up 70 between the inclined faces at 43 within the jaws 31 and 32, spreading the jaws as shown in Figure 11 until the disc 34 is free from the ledges at 33. As the jaws open their projections 36 move apart 75 allowing the sliding portion 40 of the spring box to snap into position, occupying the groove behind the rounded head 37 so as to make sure that the projections 36 on the jaws cannot accidentally become 80 re-engaged with the head 37. This action occurs before the jaws are spread widely enough for the shelves or ledges 33 to release the disc 34 connected to the cable g. The disc 34 on the cable g, when it 85 is released, immediately falls back against the rounded head 37 which in turn is supported by the end 42 of the pivoted member h on the junction plate d, and the pull is transmitted via the junction plate from 90 the cable e connected to the principal tug.

The above described examples of constructions according to the invention will suffice to illustrate its practical applications, and either form as in Figures 4 to 7 95 or Figures 10 to 12 may be used as may be found preferable according to the circumstances of any particular case. In the first described from the socket member k presents simple surfaces of revolution externally which are but little liable to damage on pulling over the ground or falling. In the second described construction the jaws 31, 32 of the socket member can separate when released, and although 100 they will generally remain close together, they are perhaps rather more likely to be damaged by impact with the ground when falling.

In the construction of Figures 10 to 12 110 the end portions of the jaws 31, 32 may be made separately as shown, each as the half of a conical member so that the two parts, when the jaws are closed fit closely together. These parts are welded at 44 to 115 the pivotally connected parts of the jaws to form a unitary structure therewith. It is convenient to make these ends separately so as to give ready access thereto for shaping the engaging surfaces before the 120 ends are welded on to the pivotally connected parts of the jaws.

It will be evident that the constructions described may be modified in several respects in either case without departing 125 from the scope of the invention, but in all cases the device will include a member such as h through which the cable g passes and against which a part of the coupling abuts to effect the release when it is re- 130

quired to disconnect the assistant tug from the junction plate or other attachment connecting the member to be towed so as to effect its release. Precisely similar conditions may arise when two marine tugs are pulling a single vessel and it may be required to release the connection to one of the tugs at short notice.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A towing and release device for use when two tugs are employed at the start of a towing operation, of which one is an assistant tug intended to be disconnected after the starting period, and wherein a length of cable from the principal tug passes over a junction plate connected to the vessel or glider to be towed and is coupled to another length of cable leading to the assistant tug, the device being adapted to effect automatically the release of the towing connection to the assistant tug when the towing effect of this tug is reduced while the principal tug continues to exert its normal towing effect, for which purpose a coupling is provided between the length of cable from the assistant tug and the end of the cable from the principal tug beyond the junction plate, and a plug member is provided in the junction plate through which the cable from the principal tug passes, the said coupling having jaws, pawls or the like on one part adapted to engage with a spigot, disc or the like on the other part, the construction being such that the jaws, pawls or the like are released for disconnecting the cable leading to the assistant tug when the coupling is drawn against the plug member aforesaid under the continual pull of the principal tug on its length of cable while the pull of the assistant tug is being reduced.

2. A coupling adapted for use in accordance with claim 1, comprising an outer portion of socket form enclosing pawls, and an inner portion of spigot form adapted to engage with said pawls, the pawls being shrouded against unintentional release due to dragging or impact but being so formed that a plug member which can move over the spigot member can release the pawls even when under load.

3. A coupling according to claim 2 wherein the pawls are disposed within slots in one part of the outer portion of the coupling and are mounted on pivots whose ends are enclosed by the shrouding part which embraces the open end of the first part of the said outer portion, the pawls being pressed inwardly by springs

and being balanced statically about their pivots.

4. A coupling according to claim 2 wherein electrical connections are made to the socket portion of the coupling adapted to co-act with parts of the spigot portion of the coupling, one of said connections being made through a spring-pressed plunger in the socket portion engaging with an insulated terminal on the spigot portion.

5. A coupling adapted for use in accordance with claim 1, comprising a member formed with pivotally connected jaws having ledges for engagement with a head or disc on the cable end to which the pull is to be applied, and also having hook-shaped projections adapted to be engaged by a rounded head on a tubular fitting which can move over the end portion of the cable, the plug member being adapted when it comes into action to press up said tubular fitting releasing it from the hook-shaped projections and causing it to spread the jaws until their ledges release the head or disc on the cable end.

6. A coupling according to claim 5 in which a spring box is provided on the tubular fitting member, adapted when the coupling is in action to engage the backs of the hook-shaped projections, and also adapted, when said jaws are being released after the rounded head on the tubular fitting has left the projections, to snap into engagement under the rounded head thereby preventing it from accidentally re-engaging said projections.

7. The combination with a coupling device in accordance with claim 1, of a junction plate having a pulley around which passes the cable to which the pull is to be applied, connections from said junction plate to the member to be towed, and a pivotally mounted plug member through which the cable passes, the head of said plug member being adapted to engage with and to effect the release of the coupling when the coupling is drawn against said plug member.

8. A coupling adapted for use according to claim 1, constructed and adapted to operate substantially as described with reference to Figures 4 to 6 of the accompanying drawings.

9. A coupling adapted for use according to claim 1, constructed and adapted to operate substantially as described with reference to Figures 10 to 12 of the accompanying drawings.

10. A towing and release device according to claim 1 wherein a principal tug and an assistant tug are enabled to pull a glider until it is safely air-borne, and to effect disconnection of the assistant tug thereafter, leaving the principal tug in

towing connection with the glider, substantially as described with reference to Figures 1 and 2, and to Figures 4 to 6 of the accompanying drawings.

- 5 11. A towing and release device according to claim 1 wherein a principal tug and an assistant tug are enabled to pull a glider until it is safely air-borne, and to effect disconnection of the assistant tug
10 thereafter, leaving the principal tug in

towing connection with the glider, substantially as described with reference to Figures 1 and 2, and to Figures 10 to 12 of the accompanying drawings.

Dated this 29th day of February, 1944.

For the Applicants:

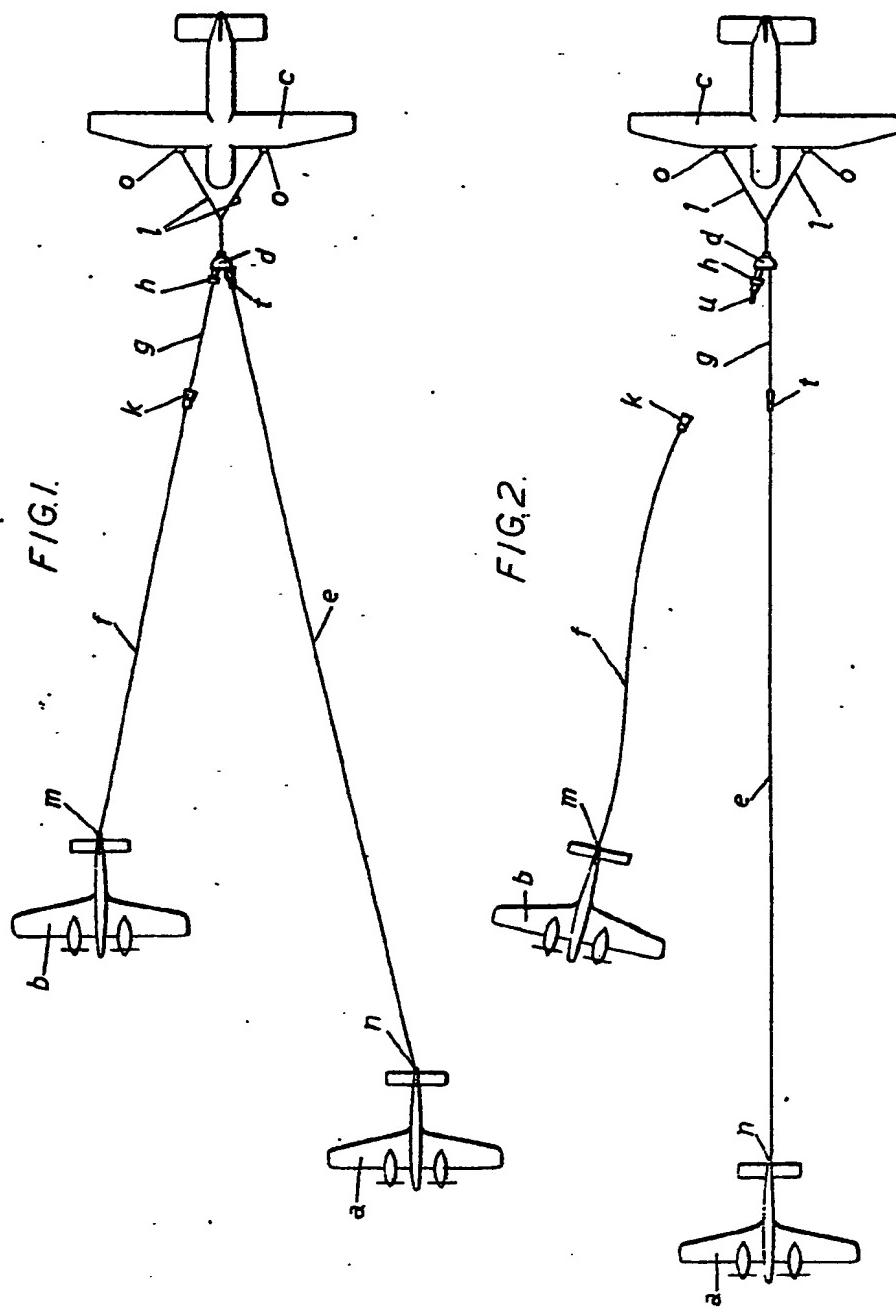
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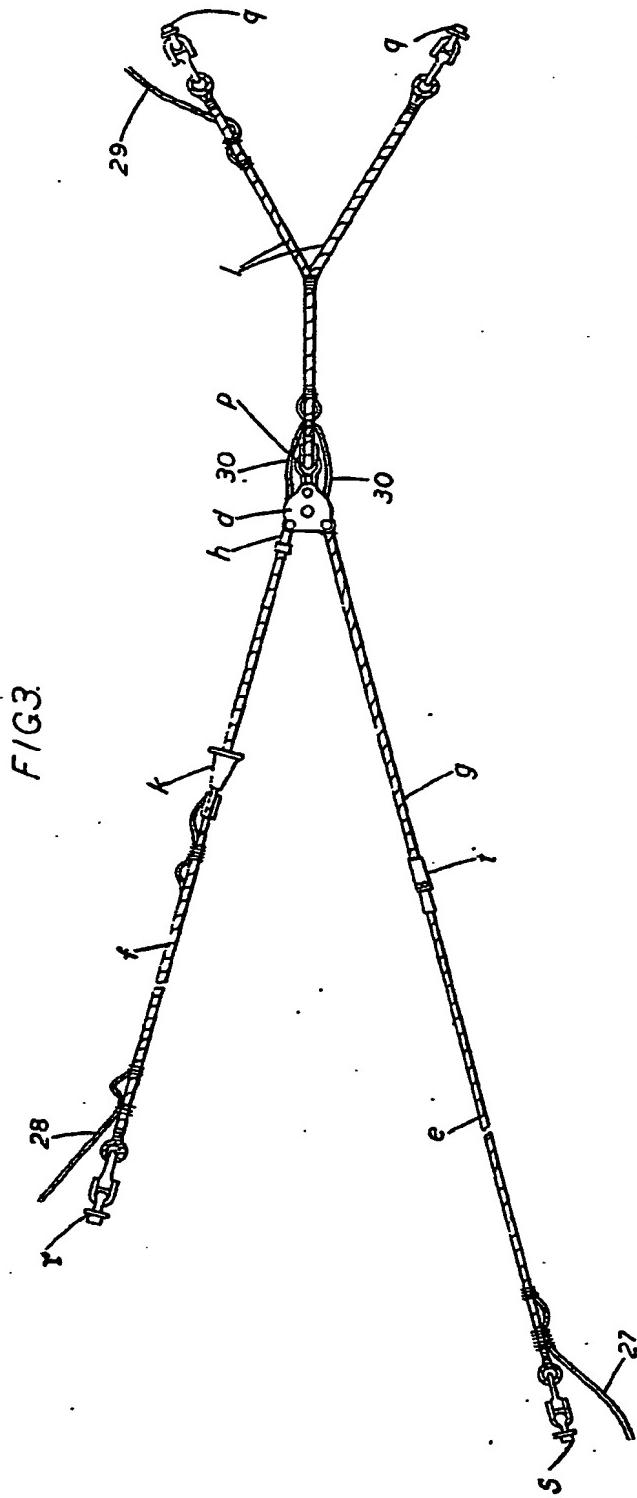
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SHEET 1

5 SHEETS
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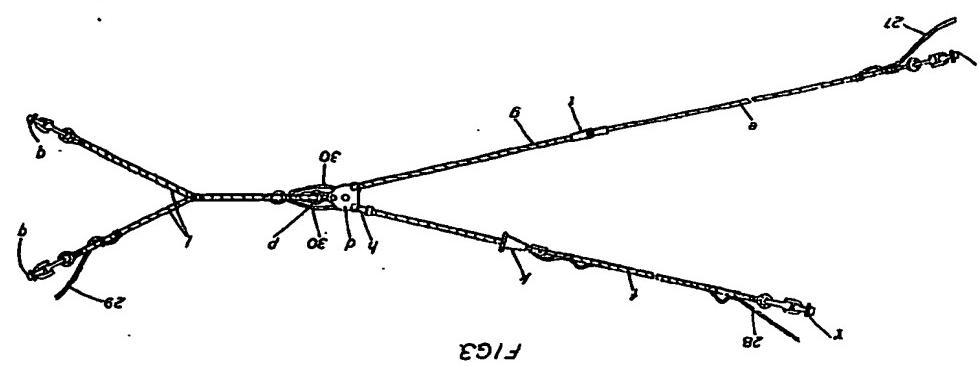


FIG. 3

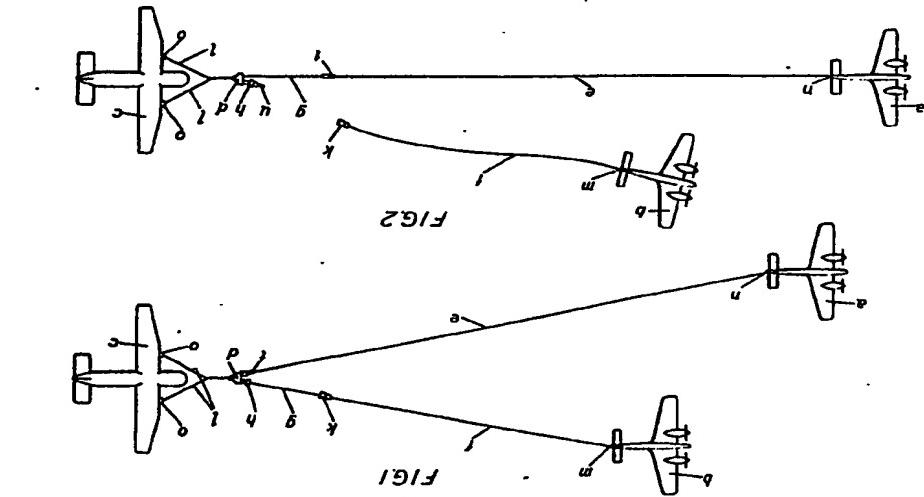
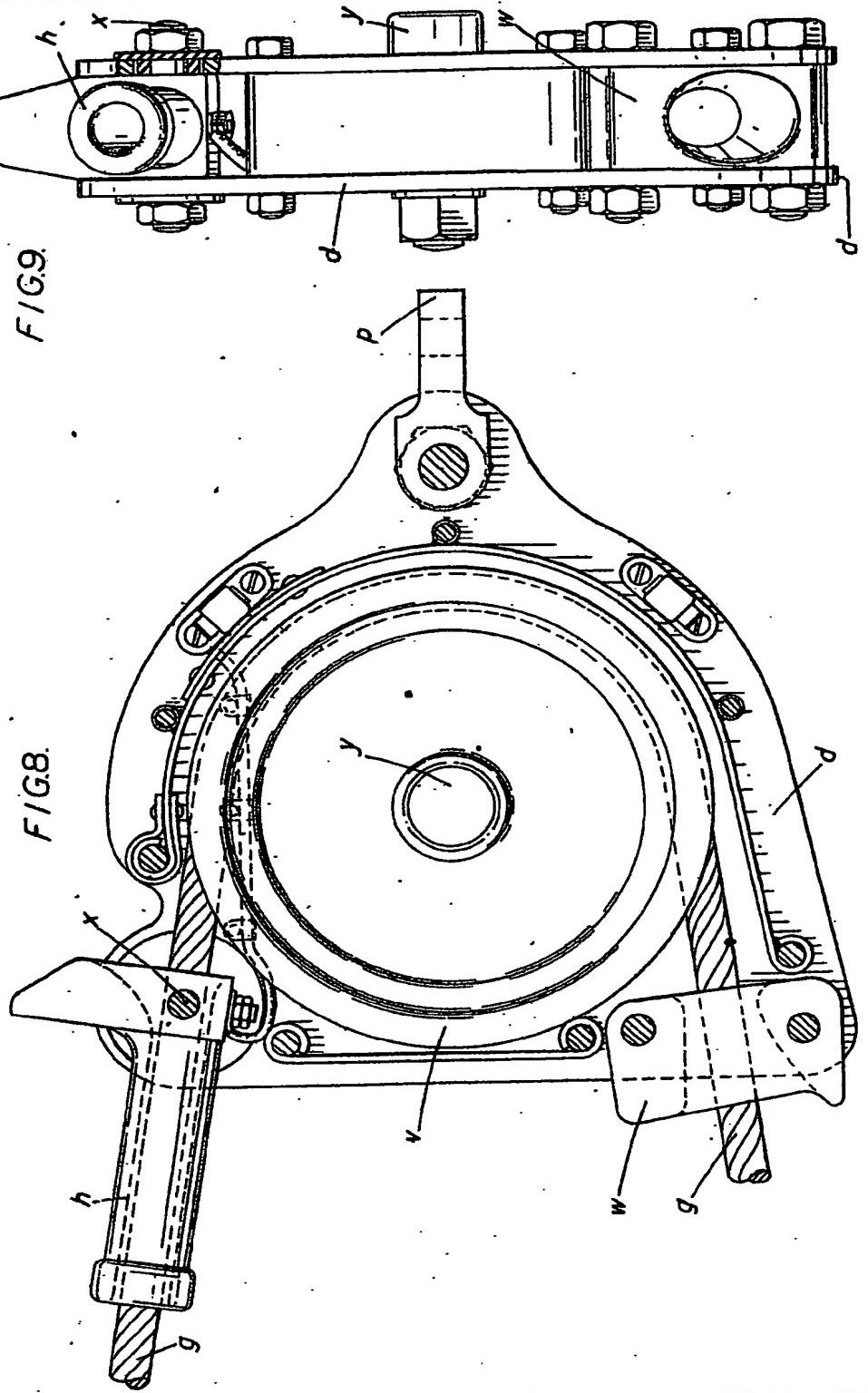


FIG. 1

FIG. 2

[This Drawing is a reproduction of the Original on a reduced scale.]



[This Drawing is a reproduction of the Original on a reduced scale.]

FIG.4.

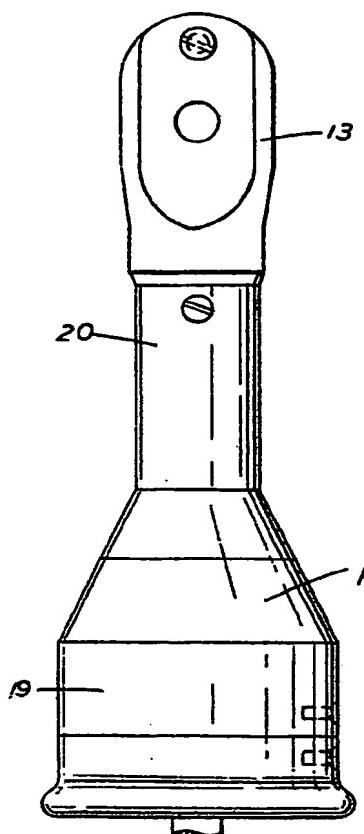


FIG.5.

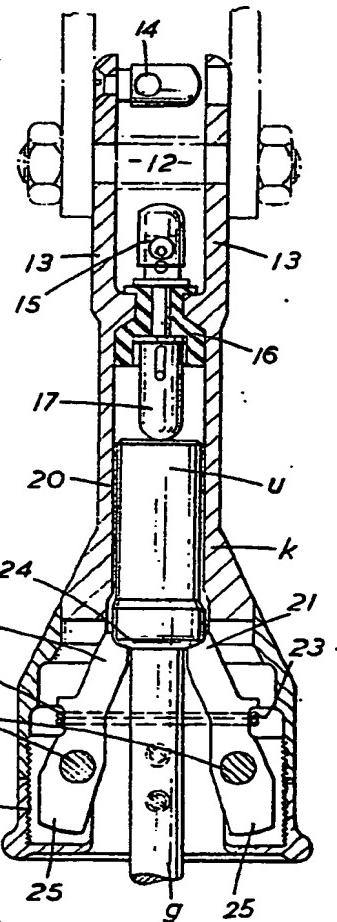
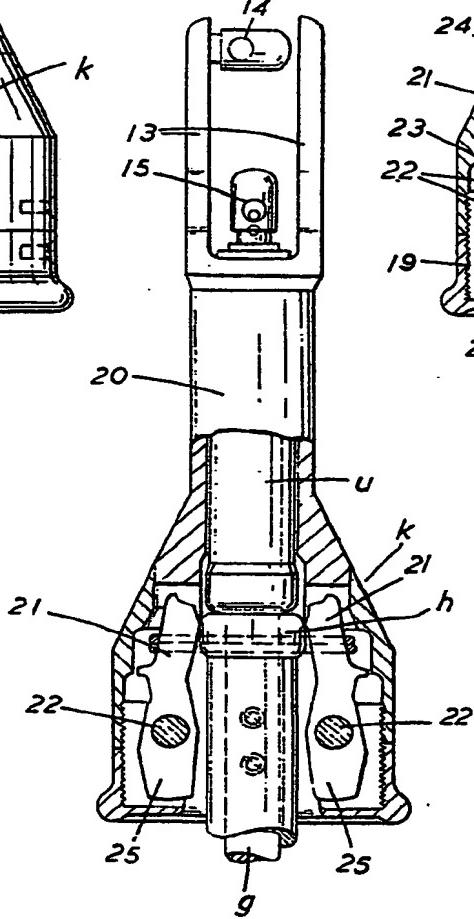
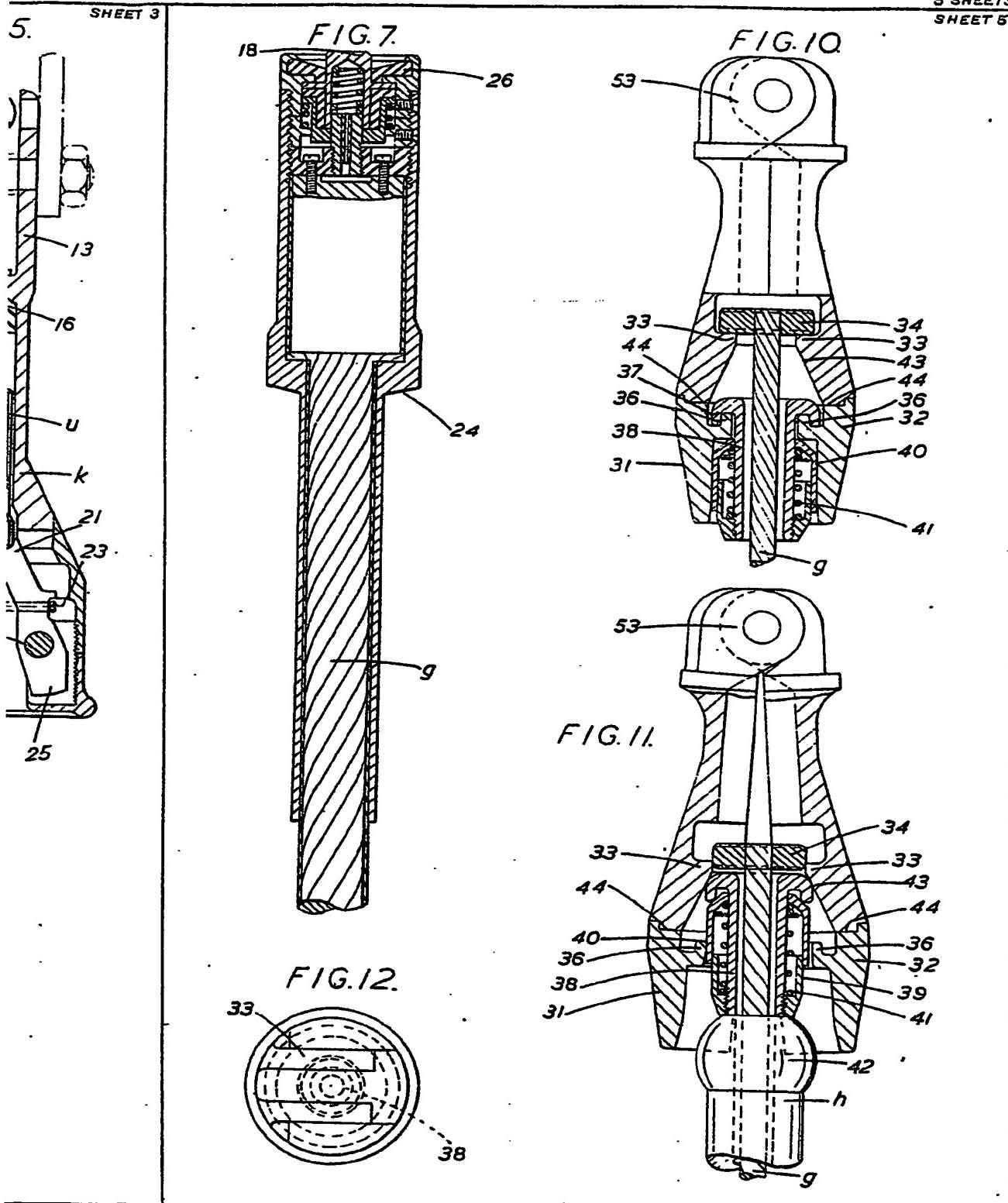
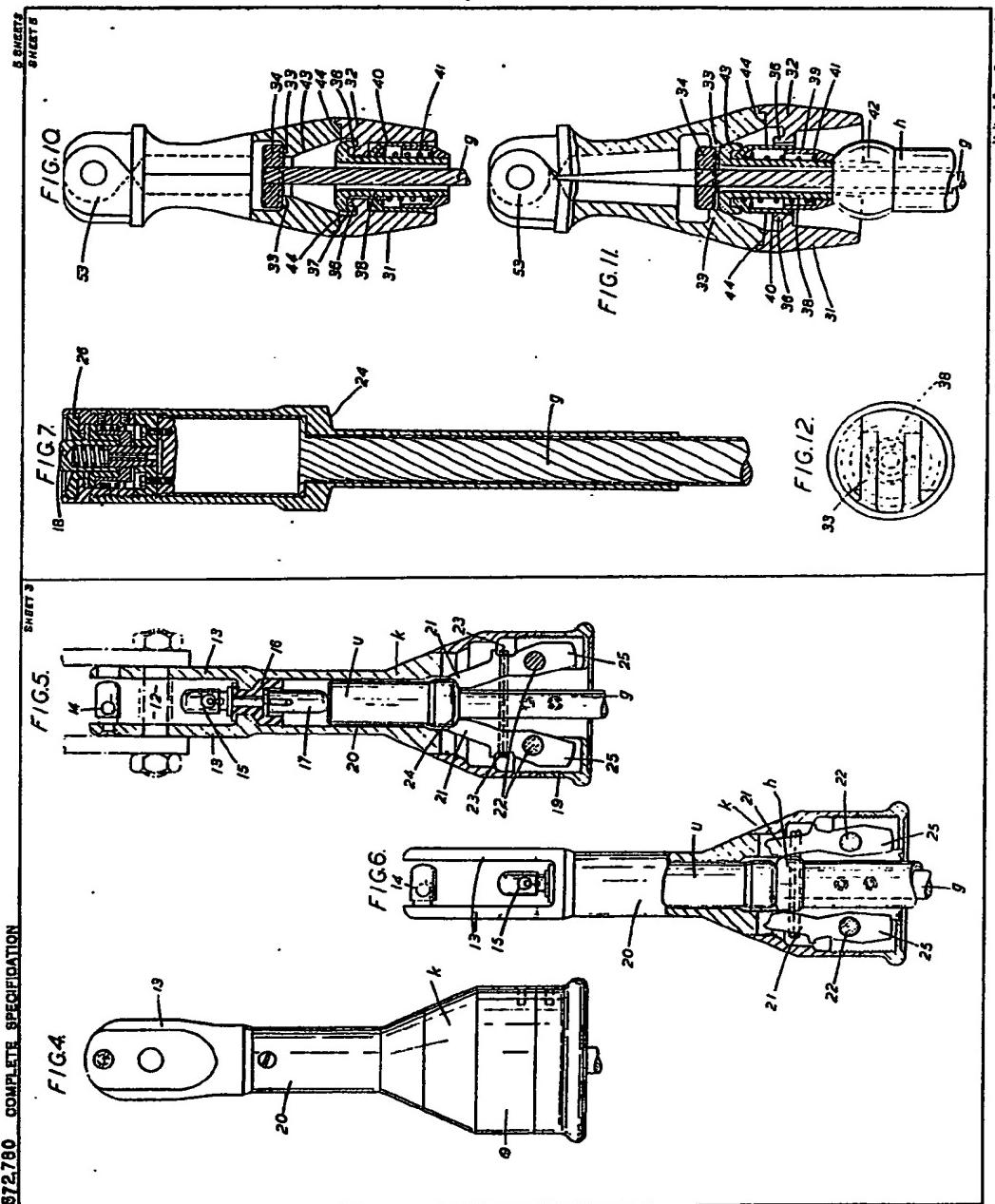


FIG. 6.





372,780 COMPLETE SPECIFICATION



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